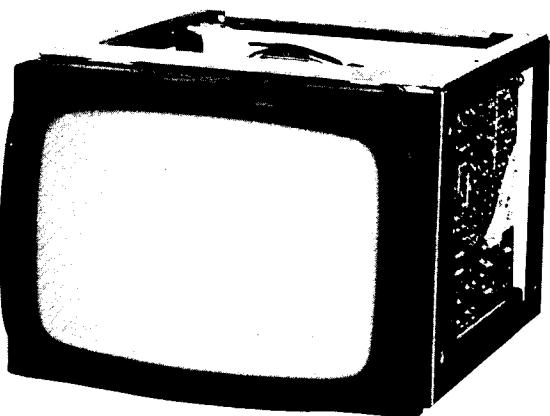


# Service Manual

CRT Data Display  
MODEL TR-60S1A  
Chassis No. Y21



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**Panasonic**®

Panasonic Industrial Company Division of  
Matsushita Electric Corporation of America  
One Panasonic way, Secaucus, New Jersey 07094.

## SAFETY PRECAUTIONS

### 1-1 CAUTION:

No modification of any circuit should be attempted. Service work should only be performed after you are thoroughly familiar with all of the following safety checks and servicing guide lines.

### 1-2 SAFETY CHECK

Care should be taken while servicing this CRT display because of the high voltage used in the deflection circuits. These voltages are exposed in such areas as the associated flyback and yoke circuits.

### 1-3 FIRE & SHOCK HAZARD

- 1-3-1 Insert an isolation transformer between the CRT display and AC power line before servicing chassis.
- 1-3-2 In servicing pay attention to original lead dress especially in the high voltage circuit. If a short circuit is found, replace all parts which have been overheated as a result of the short circuit.
- 1-3-3 All the protective devices must be reinstalled per original design.
- 1-3-4 Soldering must be inspected possible for cold solder joints, frayed leads, damaged insulation, solder splashes or sharp solder points. Be certain to remove all foreign material.

### 1-4 IMPLOSION PROTECTION

All Panasonic picture tubes are equipped with an integral implosion protection system, but care should be taken to avoid damage and scratching during installation. Use only Panasonic replacement picture tubes.

### 1-5 X-RADIATION

**WARNING:** The only potential source of X-Radiation is the picture tube. However when the high voltage circuitry is operating properly there is no possibility of X-Radiation problem. The basic precaution which must be exercised is to keep the high voltage at the following factory-recommended level.

Note: It is important to use an accurate periodically calibrated high voltage meter.

- 1-5-1 To measure the high voltage, use a high impedance high voltage meter. Connect (-) to chassis and (+) to the CRT anode button.
- 1-5-2 Turn the Brightness control fully counterclockwise.
- 1-5-3 Measure the high voltage. The high voltage meter should indicate at the following factory-recommended level.
- 1-5-4 If the upper meter indication exceeds the maximum level, immediate service is required to prevent the possibility of premature component failure.
- 1-5-5 To prevent X-Radiation possibility, it is essential to use the specified picture tube.
- 1-5-6 The nominal high voltage is 7KV and must not exceed 8KV at zero beam current at rated voltage.

### IMPORTANT SAFETY NOTICE

There are special components used in Panasonic CRT displays which are important for safety. These parts are identified on the schematic diagram and on the replacement parts list. It is essential that these critical parts should be replaced with manufacturer's specified parts to prevent X-RADIATION, shock, fire or other hazards. Do not modify the original design without written permission of the Panasonic company and this will void the original parts and labor guarantee.

## GENERAL INFORMATION

The Model TR-60S1A is CRT DATA DISPLAY of metal frame type.

TR-60S1A uses P31 (Green color) phosphor and polish Cathode Ray Tube.

Input signal is separate type and each input signal is put through 5 pin-header connector on the P.C. Board.

Input signal is for TTL level.

When connecting to equipment, directly connect it to printed circuit board input terminal through 5 pin-header connector.

In addition, +B is supplied from the outside through 5 pin-header connector, operating the monitor on +12V DC.

Features:

CRT is exceptionally superb in quality and reliability and is of polish type. Phosphor P31.

The deflecting coil is a yoke equipped with 4-P magnet and is of PANASONIC's own design that permits adjustment of geometric distortion on the raster.

Chassis is fully equipped with ICs:

- Vertical deflection
- H.P.C. (horizontal phase control)
- H.AFC/OSC

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**SPECIFICATIONS**

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**1. MECHANICAL DESCRIPTION****Dimension:**

Height: 4.4" (112mm) max.  
 Width: 6.0" (152mm) max.  
 Depth: 7.4" (188mm) max.  
 Weight: 3.75 lbs (1.7kg) max.

**Picture Tube:** 150BGB31

Size 5"  
 Def. Angle 70°  
 Neck dia 0.79" (20mm)  
 Phosphor P31

**Tilt:** 0°**2. ENVIRONMENTAL****Temperature:**

Operating: 0 ~ 55°C  
 Non-operating: -40 ~ 65°C  
 Storage and shipment: -40 ~ 65°C

**Humidity:**

Operating, Non-operating, Storage and Shipment: 5 ~ 90% (No condensation)

**Altitude:**

Operating: 0 ~ 12,000 feet (0 ~ 3,600m)  
 Non-operating: 0 ~ 12,000 feet (0 ~ 3,600m)  
 Storage and shipment: 0 ~ 40,000 feet (0 ~ 12,000m)

**Vibration and shock (Packaged condition):****Vibration:**

Frequency: 5 ~ 50 Hz  
 Vertical: 1.25G  
 Horizontal: 0.75G

**Shock:**

Bottom: Height 21.65" (55cm)  
 Front, Back, Side,  
 Corner and Edge: Height 9.84" (25cm)

**3. ELECTRIC PERFORMANCE****Power Supply:**

Input Voltage: 12V DC  
 Input Current: 0.8A max.

**Input Signals:****Video Signal:**

Polarity: Positive  
 Signal Level: TTL  
 Input Imp.: 75 ohm min. 40pF max.

**Vertical Sync:**

Polarity: Positive  
 Signal Level: TTL  
 Input Imp.: 1k ohm min. 40pF max.

**Horizontal Sync:**

Polarity: Positive  
 Signal Level: TTL  
 Input Imp.: 1k ohm

**Note:** Max rise and fall times (from 10% to 90%) of input signals are less than 10ns.

**Image test condition:**

Display: Full flat field (40 ft-L)  
 Brightness: Max.  
 View Direction: Parallel to the CRT axis  
 Ambient Temperature:

Room temperature

Supply Voltage: 12V DC

**Terrestrial Magnetism:**

Horizontal field 0 Gauss  
 Vertical field 0.5 Gauss

**Note:** 1. All measurements shall be made under normal conditions after an initial warm-up time of more than 20 minutes.  
 2. Normal conditions are as stated in above image test condition. (Condition of following each item is normal condition unless otherwise stated.)

**Image:**

Image Size: Horizontal  $4.17 \pm 0.18''$  (106  $\pm$  4mm)  
 Vertical  $2.95 \pm 0.18''$  (75  $\pm$  4mm)  
 Distortion: See Fig. 1  
 Centering: See Fig. 2  
 H. Tilt: See Fig. 3

**Image size variation:**

Cause	Image size variation from the normal image size	Range of variation
By Brightness	within 0.1" (2.5mm) (Horizontal and Vertical)	0 ~ 60 FL
By Power Supply Voltage	within $\pm 0.14''$ ( $\pm 3.5$ mm) (Horizontal and Vertical)	12V DC $\pm$ 3%
By Temperature	within $\pm 0.14''$ ( $\pm 3.5$ mm) (Horizontal and Vertical)	$25 \pm 30^{\circ}\text{C}$

**Resolution:** 500 TV line type (center)  
 350 TV line type (center)

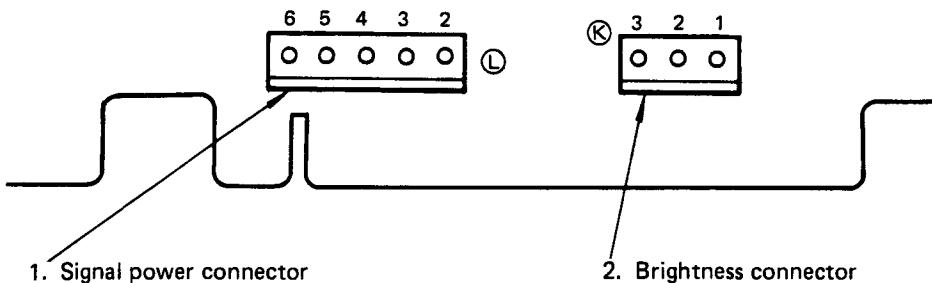


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CONNECTOR WIRING

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## P.C.B. HEADER CONNECTION



5P header : AMP641215-5

Pin No.	Description
2	H. Sync
3	+ 12V
4	Video
5	V. Sync
6	SG

3P header : AMP6412515-5

Pin No.	Description
1	High
2	Arm
3	Low

NOTE: BRIGHT. VR

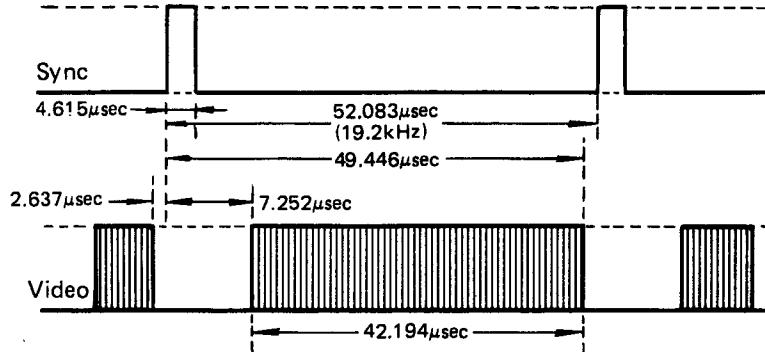
100KB±1% USER SUPPLY

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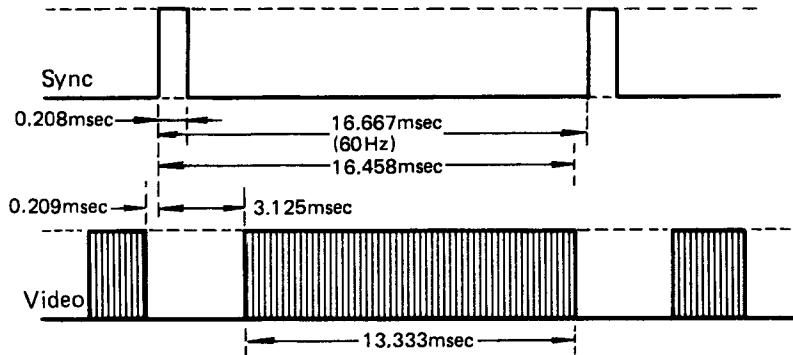
TIMING CHART

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## Horizontal Sync.



## Vertical Sync.

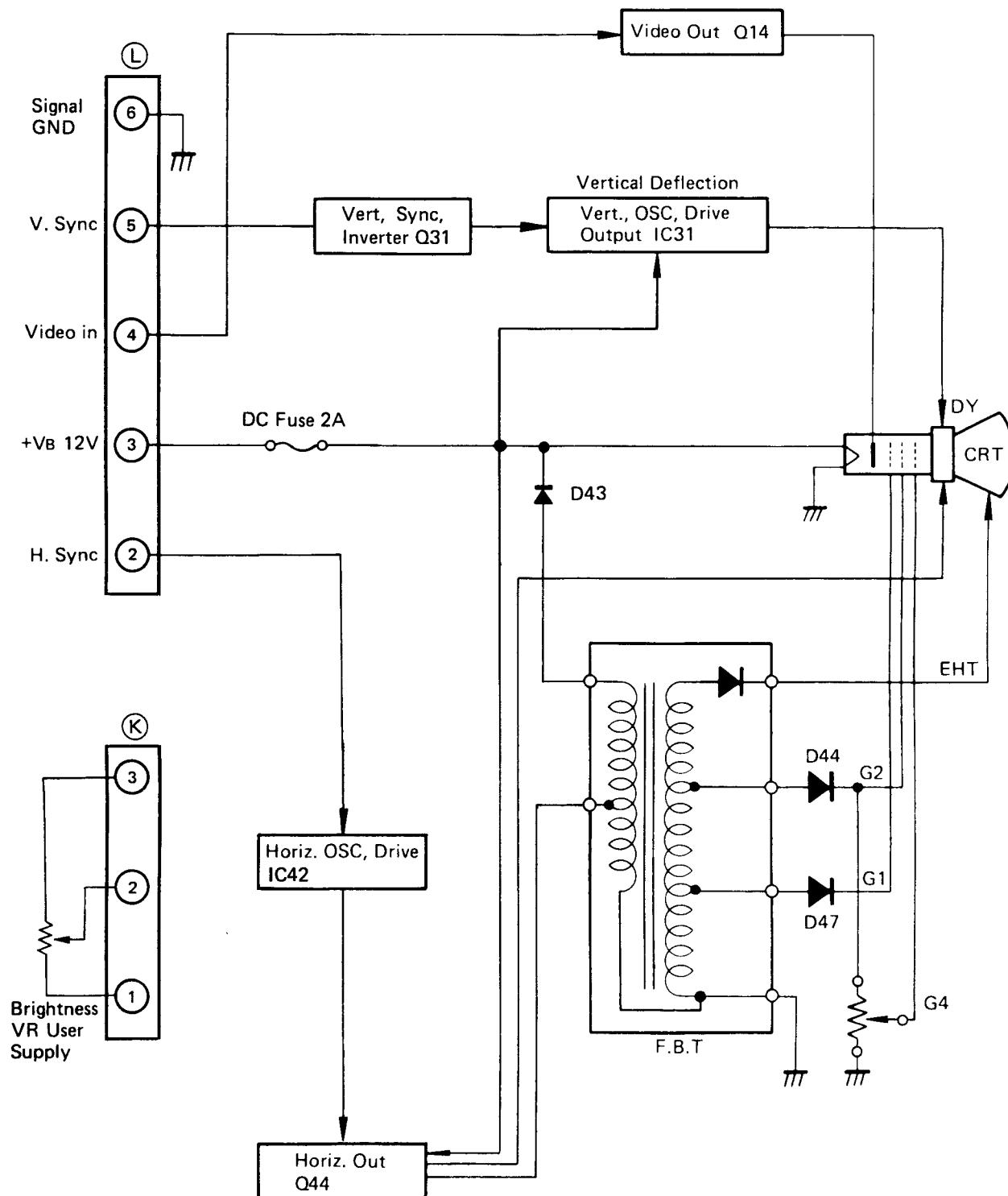


Note : Time tolerance ±0.1%.

Sample unit is adjusted according to this timing and frequency

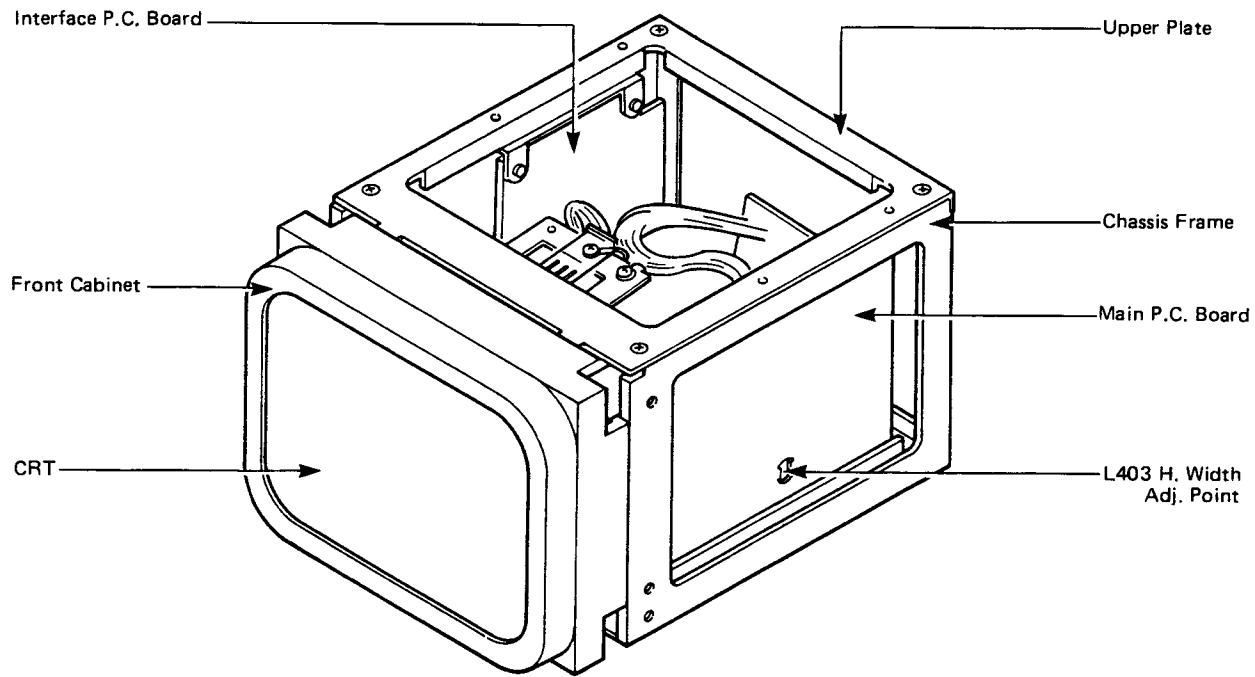
Video Signal : 50% Duty 100% Mod.

## BLOCK DIAGRAM

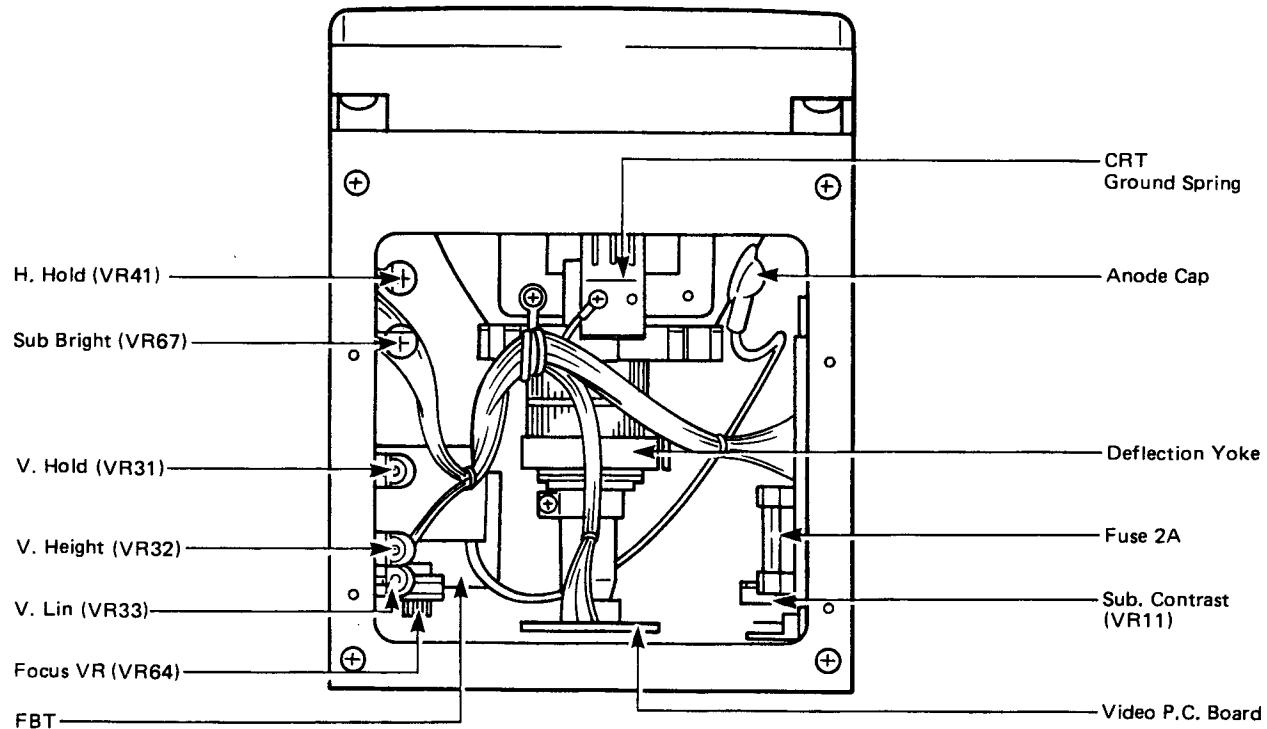


## MONITOR CIRCUIT BOARD

## DETAIL COMPONENT LOCATION



Front Chassis View



Upper Part Chassis View

# ALIGNMENT PROCEDURE

## PREPARATION

1. Connect the 5-Pin connector from the proper logic to the defined input signal.
2. Apply power to the CRT data display and allow the monitor to stabilize.
3. Adjust coils by means of a hexagonal tuning tool (non-metallic). Variable resister by — screw driver and deflection yoke (deflection distortion) by square tuning tool (non-metallic).
4. All controls are set at optimum position prior to shipment.

## ADJUSTMENT PROCEDURE

### • Image Tilt Adjustment

Loosen the deflection yoke clamp and turn in the arrow directions to adjust tilt. (See Fig. 4).

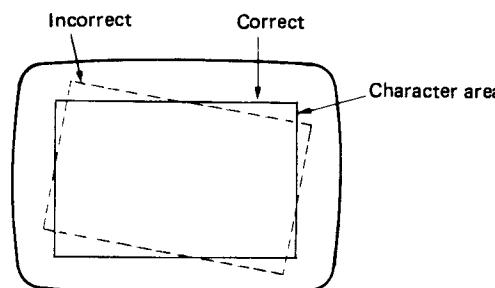


Fig. 4

### • Vertical Hold Adjustment

Adjust the vertical hold control (VR31) until the image becomes stable vertically as shown in Fig. 5.

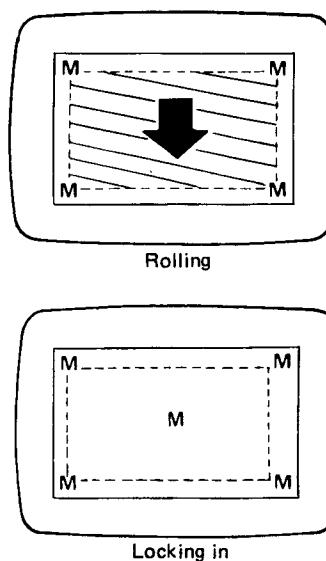


Fig. 5

Checking of height, width and bright should be performed more than 30 minutes after power is applied.

Measure the luminous intensity near the center of CRT and set at  $50 \text{ Lx} \pm 20\%$  (40 to 60 Lx). These adjustment are performed on the basis of the input signal of timing chart (page 4).

### • Horizontal Hold Adjustment

Adjust the horizontal hold control (VR41) to get stable character (syncroning condition) as shown in below (See Fig. 6).

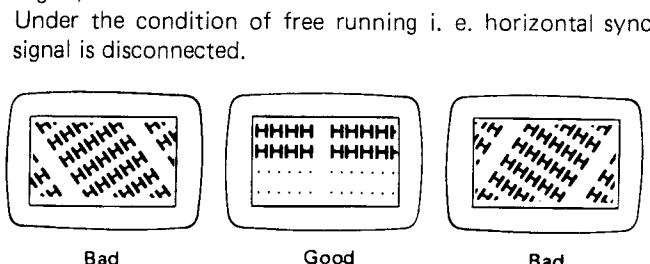


Fig. 6

### • Vertical Height Adjustment

Adjust the vertical height control (VR32) to set the vertical height of the active character area as shown in Fig. 8.

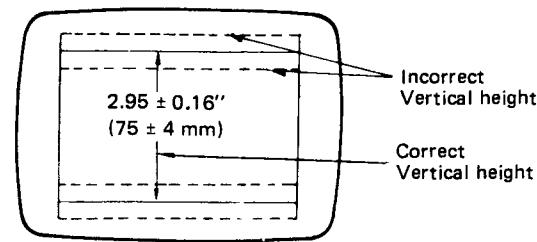


Fig. 8

#### • Horizontal Width Adjustment

Adjust the horizontal width coil (L403) to set the proper width of the active character area as shown in Fig. 9.

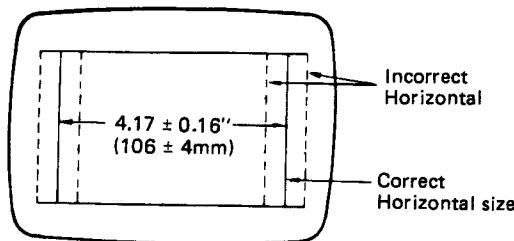


Fig. 9

#### • Vertical Linearity Adjustment

Adjust the vertical linearity control (VR33) for uniform character height within the active character area as shown in Fig. 10.

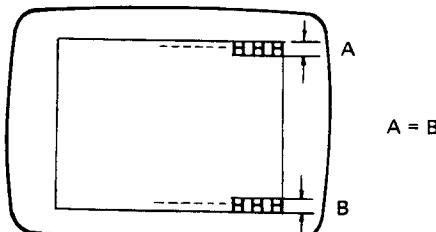


Fig. 10

#### • Centering Magnet Adjustments

Rotate the centering magnet tabs away from each other until the character area is centered on the screen as shown in Fig. 11.

Before this adjustment, be sure to ascertain H. hold.

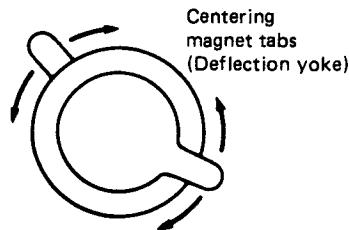
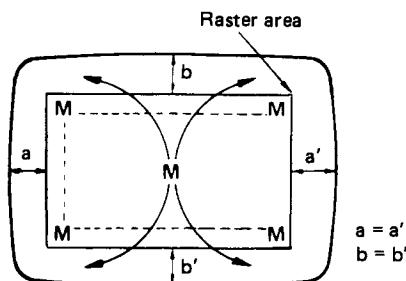


Fig. 11

#### • Focus Control Adjustment

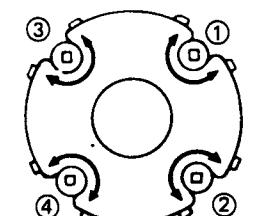
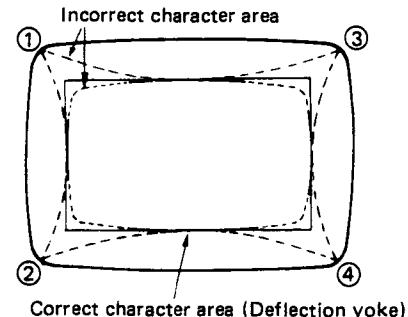
Adjust the focus control (VR64) until optimum is seen on the characters displayed within the active character area.

#### • Sub Brightness Adjustment

Look at a place 11.81" (30cm) distant from the CRT surface and set at a point where the raster slightly comes out, with the contrasts VR set at min.

#### • Correcting Magnet of Geometric Distortion (4)

Adjust each "Distortion Correcting Magnet" until the active character area is adjusted to the proper shape as shown in Fig. 12.



Deflection Correcting mag

Fig. 12

## PREASSEMBLY INSPECTION AND HANDLING INSTRUCTIONS

**Caution:**

Be sure all handling of the CRT Display is done by the CRT mounting brackets. At no time should the wires be used as a means of moving or carrying a given CRT Display. The CRT neck is the most fragile part of the CRT Display Module and extreme care should be taken not to bump, tap, or otherwise exert force on this neck.

Before applying power to the CRT Display an inspection should be preformed to insure that any foreign material has not been dropped in any part of the CRT Display.

1. Insure that the proper signal and power connections are made in accordance.

2. Apply power to CRT display under test and allow CRT display to stabilize for a minimum of 5 minutes.

Note: All adjustments have made at the factory. This procedure is to insure that these adjustments have been made correctly.

3. When turn External Brightness Control to maximum and raster should be slightly visible.
4. Check CRT display for proper centering.
5. Check CRT display for the specified active character area per Page 3, 4 of this Manual.
6. Check Geometric Distortion.
7. Check focus.
8. Check Power Supply Voltages in accordance per Page 2 of this Manual.

## CAUTION FOR SERVICING

Be sure to provide power supply sequence of more than 100 ms.

**Power ON-OFF**

Do not turn OFF power supply when the CRT heater is not sufficiently heated. Otherwise, CRT may be burned in spot.

In case of servicing or replacing CRT, high voltage sometimes remains in the anode of CRT. So, completely discharge high voltage before servicing or replacing CRT so as to prevent a shock to the serviceman.

In this case, discharge to the external conductive coating (aquadac) of CRT.

Discharging to other places will cause troubles. The heat sink of horizontal output transistor is applied with +B. So, do not earth it in case of servicing.

Take care to handle IC42.

Special care should be taken not to apply overvoltage or static electricity to IC42, as it is of C-MOS.

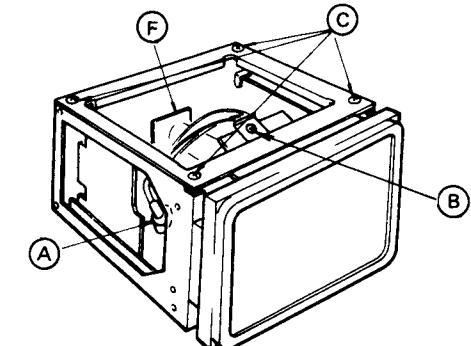
In case of storing or transporting it, be sure to take some countermeasures for static electricity. When using a soldering iron, be sure to connect it to the earth.

The unused terminal should be soldered without fail.

# DISASSEMBLY INSTRUCTION

## • How to replace the Main P.C. Board Ass'y

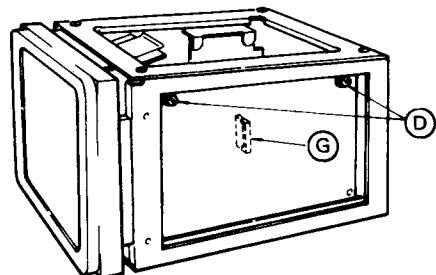
- (1) Remove the anod cap **A**  
(Care must be taken as high voltage may be remaining)
- (2) Remove the ground terminal fixing screw **B**
- (3) Remove the upper plate fixing four screws **C**
- (4) Remove the main P.C. Board fixing two screws **D**
- (5) Remove the interface P.C. Board fixing two screws **E**
- (6) Remove the CRT socket P.C. Board **F** from the CRT
- (7) Remove the deflection yoke connector **G** of the main P.C. Board



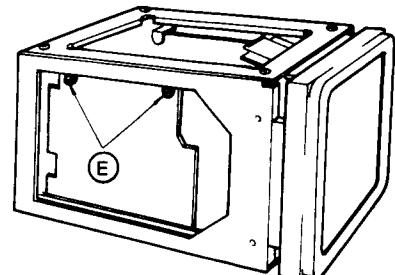
Top View

## • How to replace the CRT

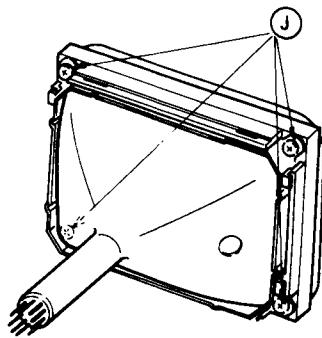
- (1) Remove the anod cap **A**  
(Care must be taken as high voltage may be remaining)
- (2) Remove the upper plate fixing four screws **C**
- (3) Remove the CRT socket P.C. Board **F** from the CRT
- (4) Remove the deflection yoke connector **G** of the main P.C. Board
- (5) Expand the frame **H** a little bit and pull out the front cabinet **I** upward, then CRT block is removed from chassis frame **H**
- (6) Remove the deflection yoke from the CRT
- (7) Remove the fixing four screw **J** from the front cabinet



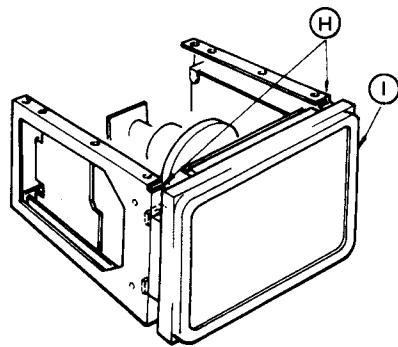
Right Side View



Left Side View

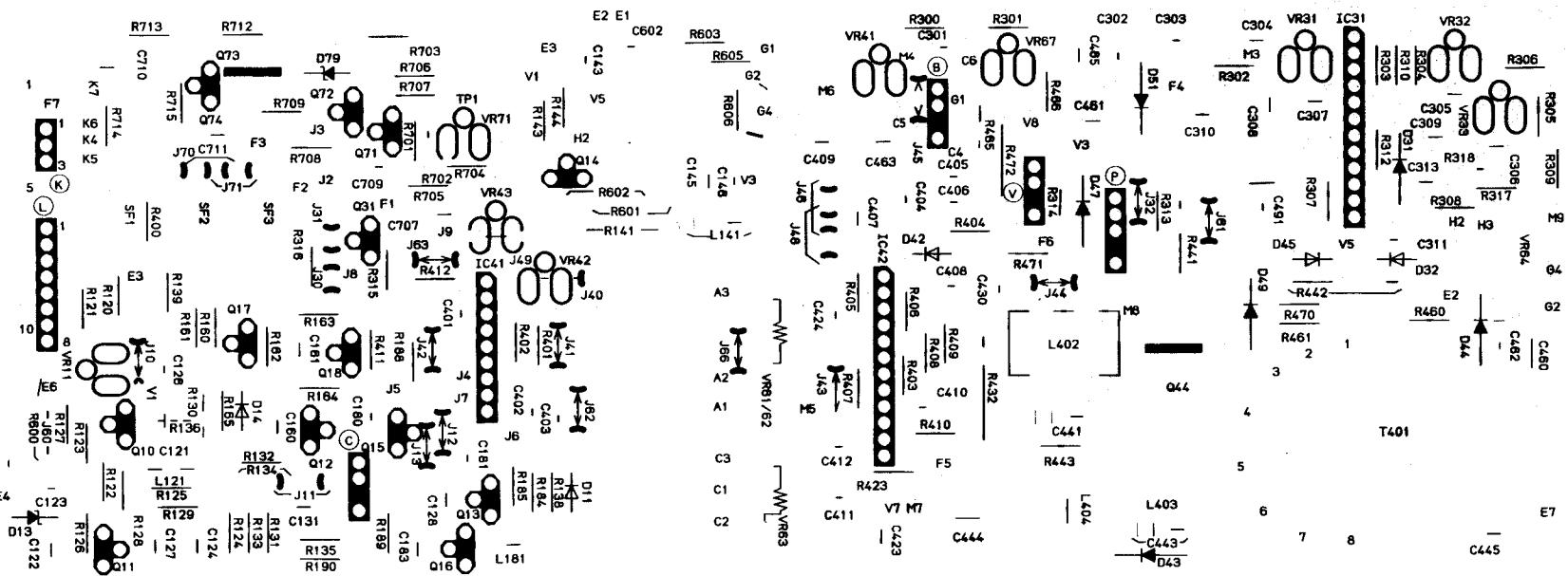


CRT. Block



Top View

## -MONITOR CIRCUIT BOARD-SOLDER VIEW



# SCHEMATIC DIAGRAM

## NOTE

### 1. RESISTOR

All resistors are carbon 1/4W resistor, unless otherwise noted the following marks.  
Unit of resistance is OHM ( $\Omega$ ), (K=1,000, M=1,000,000)

- Ⓐ Solid resistor
- Ⓑ Non Flame

### 2. CAPACITOR

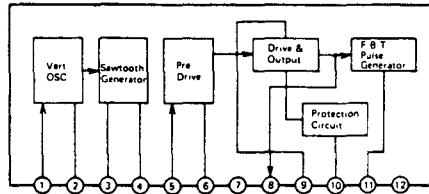
All capacitors are ceramic 50V capacitor, unless otherwise noted the following marks.  
Unit of capacitance is  $\mu F$ , unless otherwise noted.

- Ⓐ Polyester
- Ⓑ Polystyrene capacitor
- Ⓒ Electrolytic capacitor
- Ⓓ Tantalum

### 3. COIL

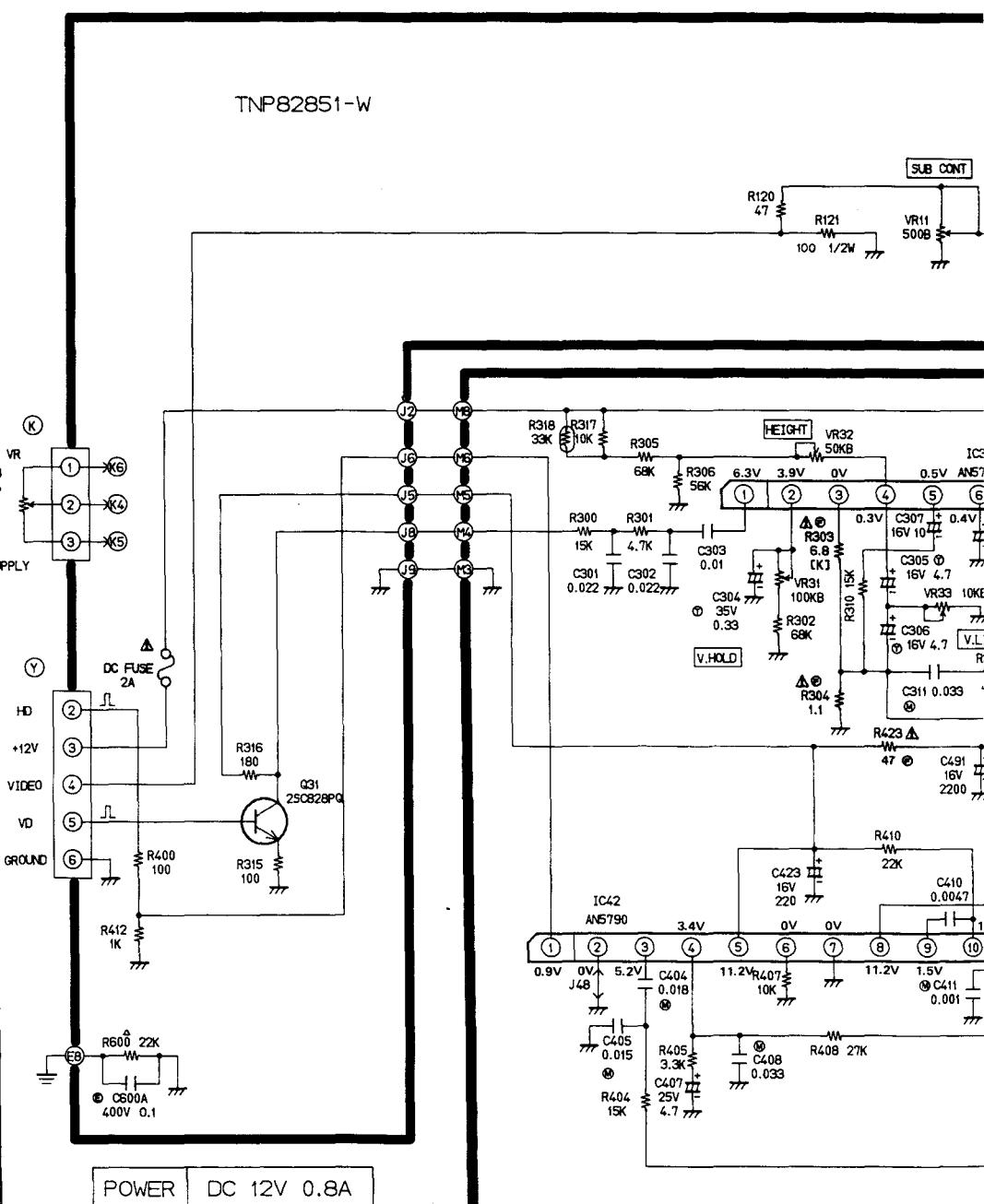
Unit of inductance is  $\mu H$ .

AN5763, AN5763



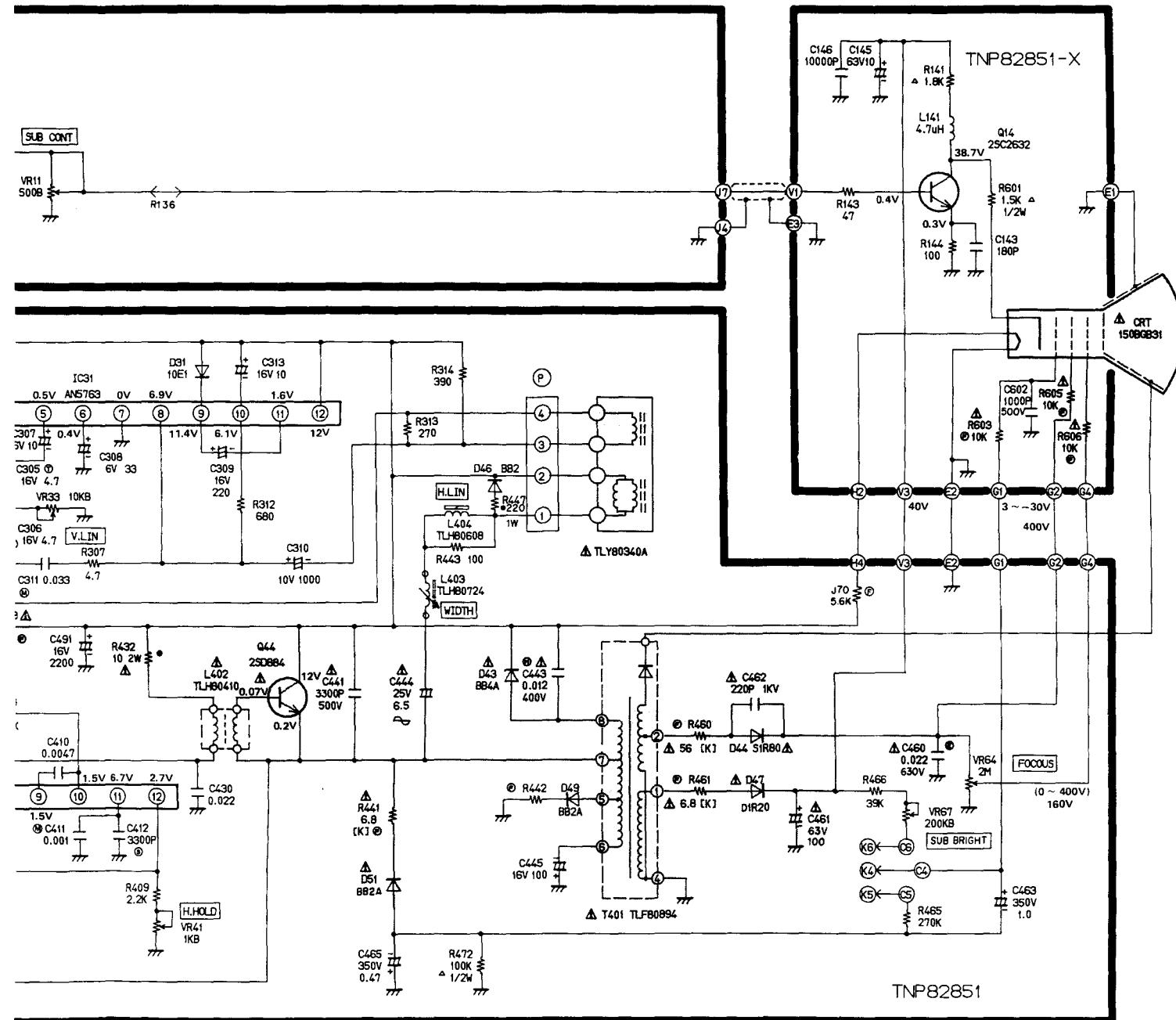
TNP82851-W

TRANSISTOR BASE INFORMATION	
LOCATION	PARTS NAME
	2SC828
	2SC2632
	2SD884
	AN5790
	AN5762 AN5763 AN5763(N)



## **IMPORTANT SAFETY NOTICE**

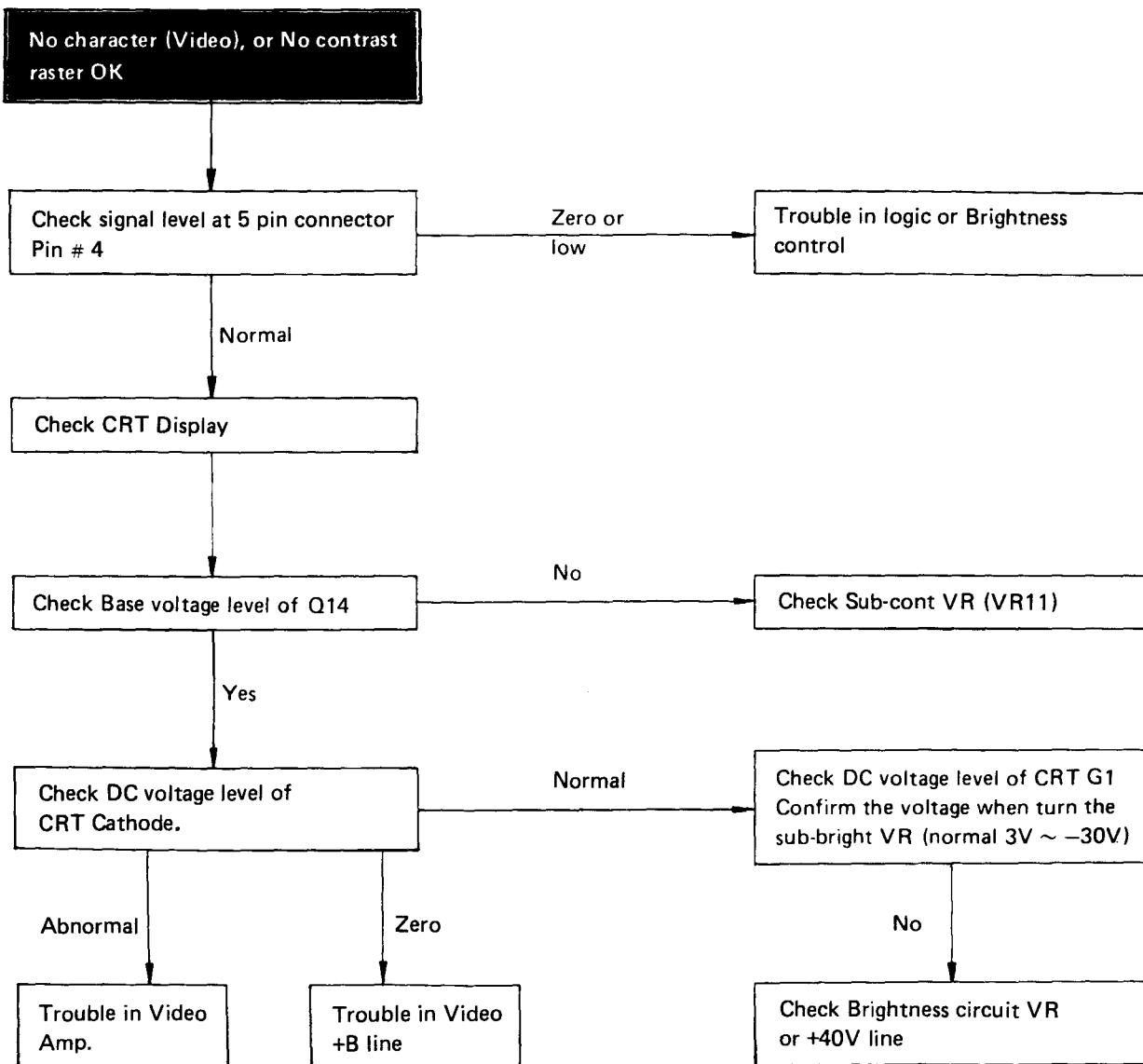
The component identified by shading or the international symbol  $\Delta$  on this schematic diagram incorporates special features important for protection from X-Radiation, fire and electrical shock hazards. When servicing it is essential that only manufacturer's specified parts be used for those critical components.

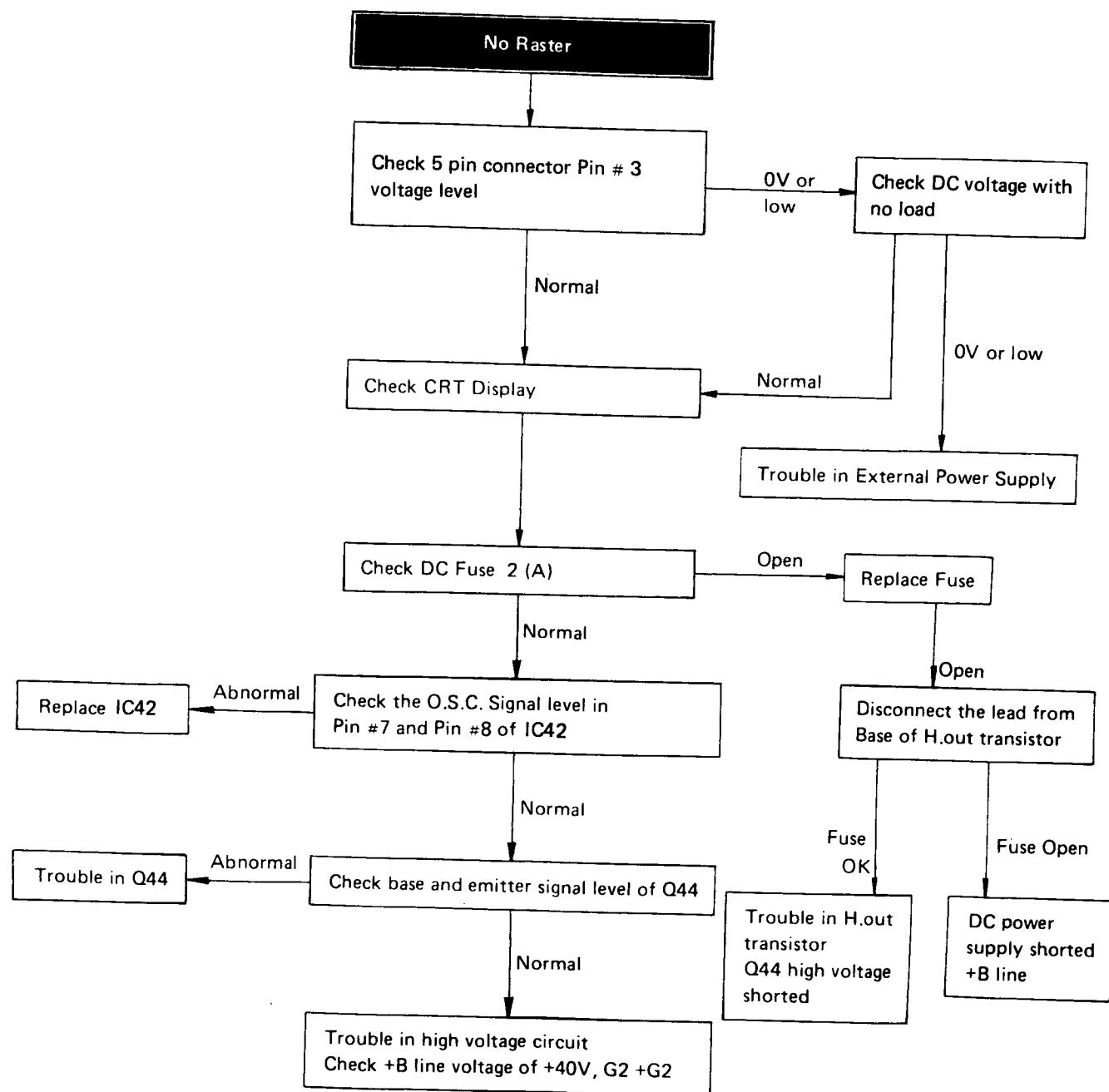


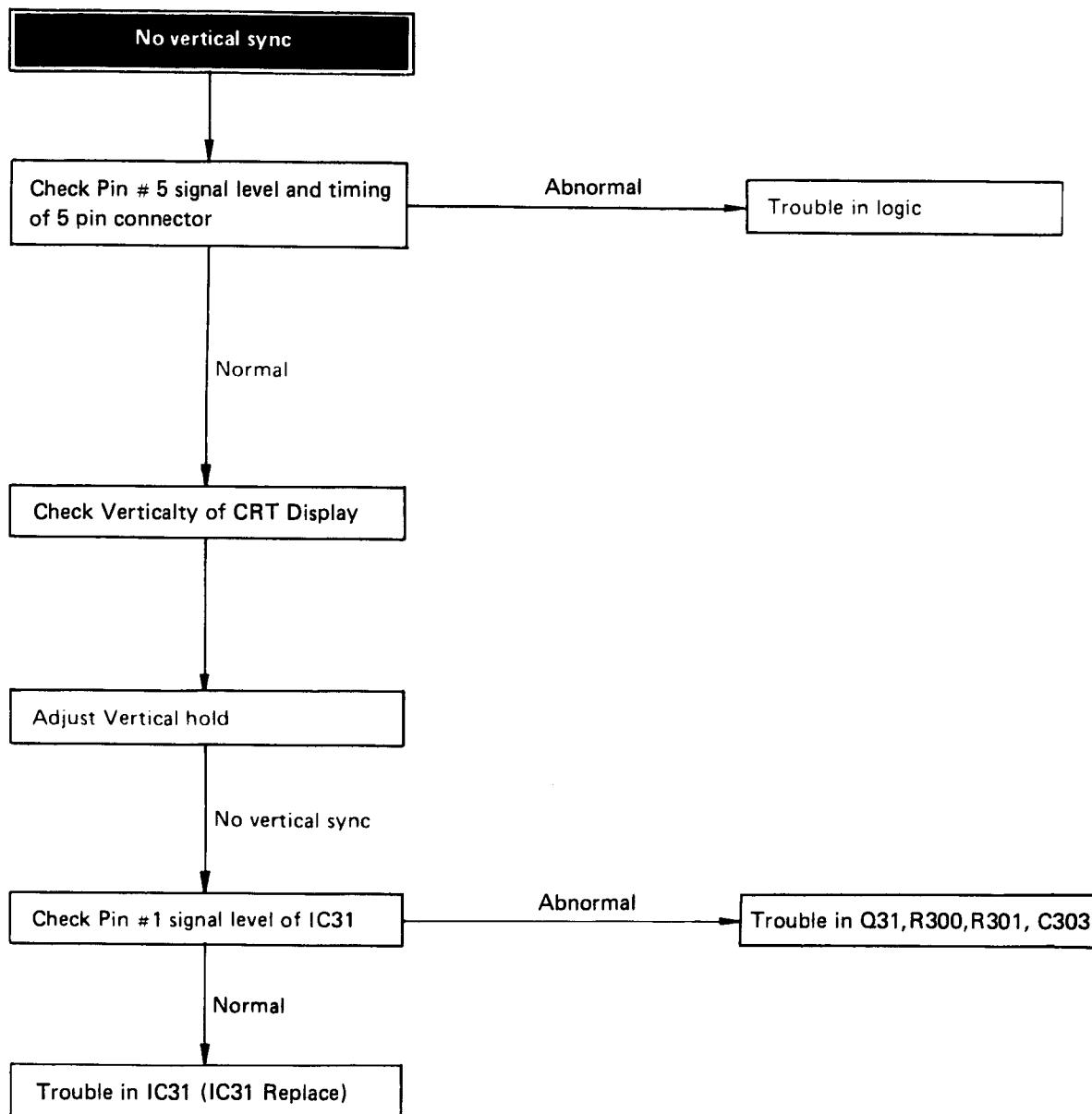
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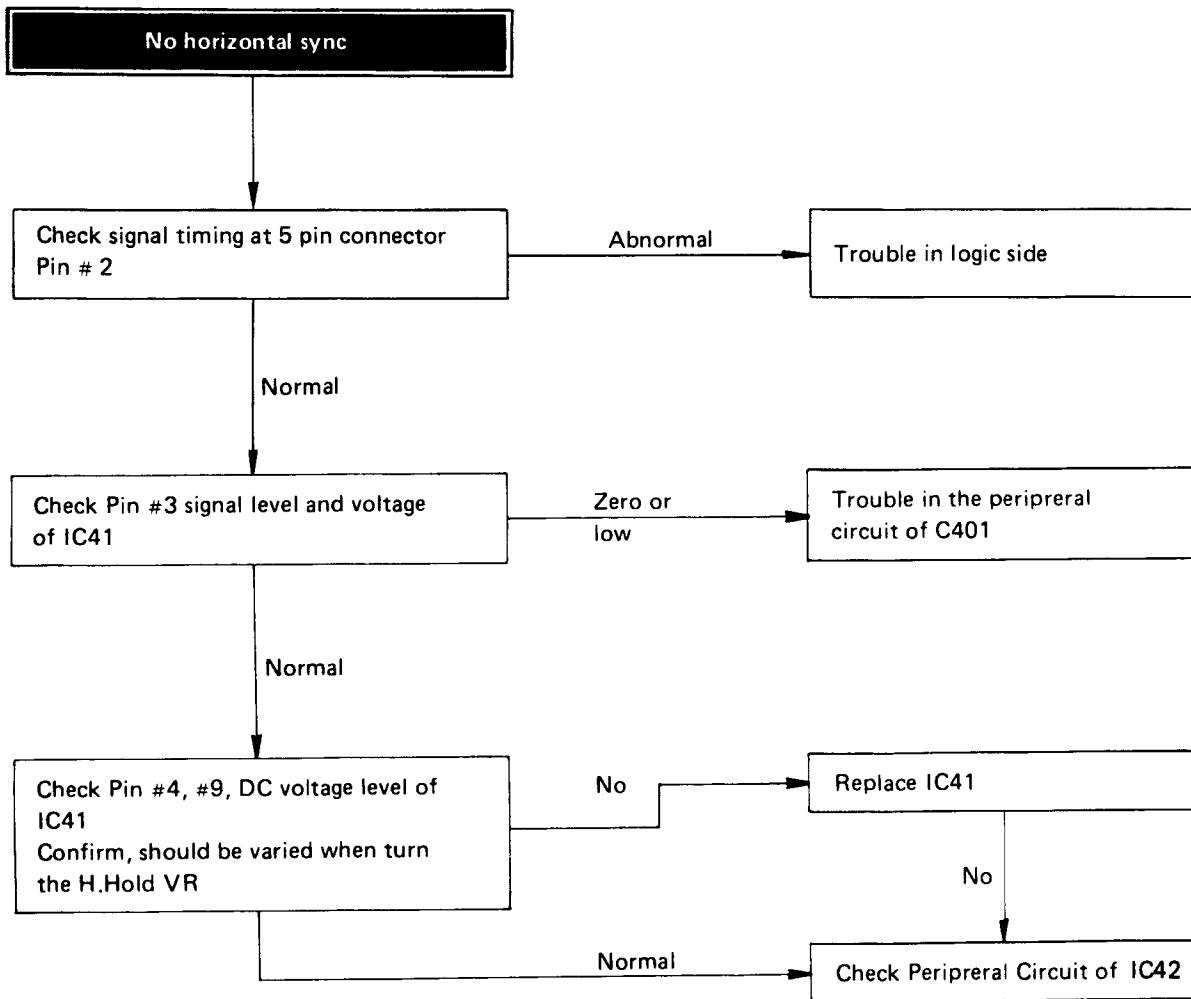
TROUBLE SHOOTING HINTS

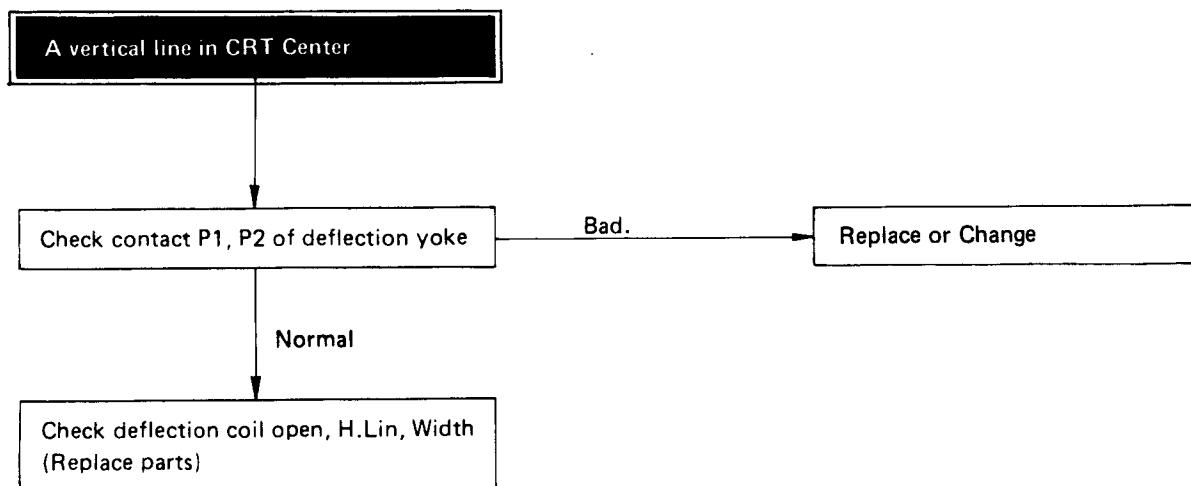
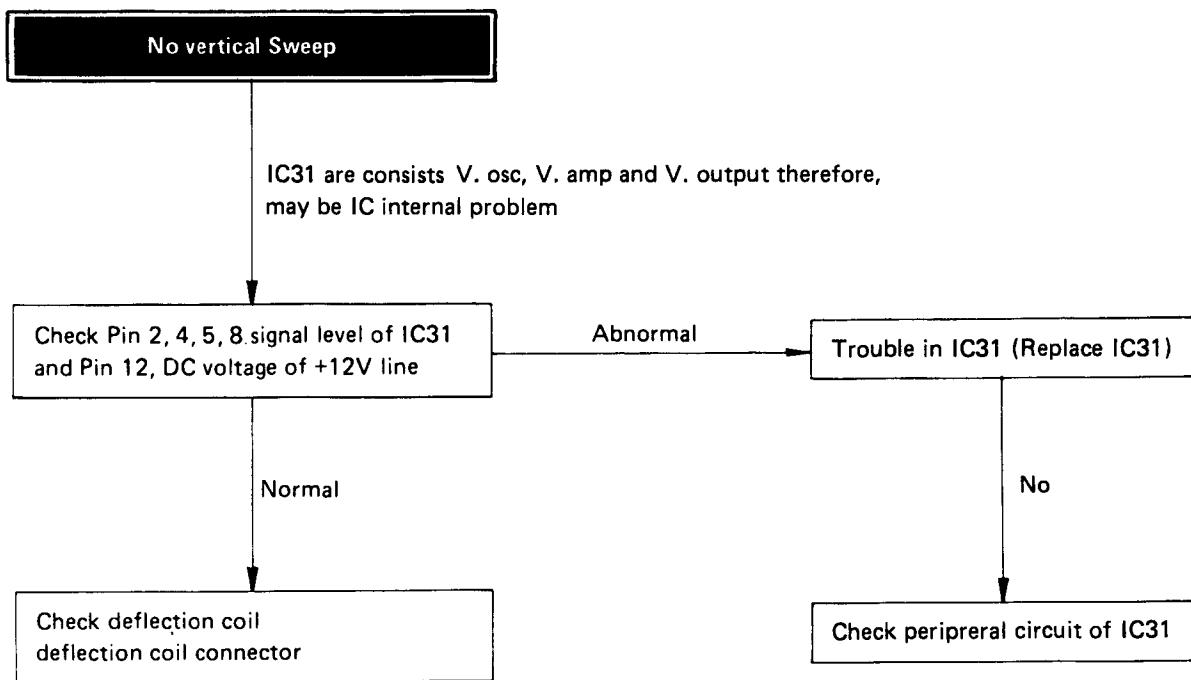
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## REPLACEMENT PARTS LIST

## Important Safety Notice

Components identified by the International symbol  have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

## RESISTOR

PART NAME & DESCRIPTION		
TYPE		ALLOWANCE
C	Carbon	F
F	Fuse	J
M	Metal Oxide	K
S	Solid	M
W	Wire Wound	G

## Part No.

Example: ERD25TJ104



100K 1/4W

## CAPACITOR

PART NAME & DESCRIPTION		
TYPE		ALLOWANCE
C	Ceramic	C
E	Electrolytic	D
P	Polyester	F
S	Styrol	J
T	Tantalum	K
PP	Polypropylene	L
		M
		P
		Z

## Part No.

Example: ECKF1H103ZF

## Description

 0.01 $\mu$ F 50V

Ref.No.	Part No.	Description	Ref.No.	Part No.	Description
	CABINET & MAIN PARTS			TRANSISTORS	
	TKY809301	FRONT CABINET	Q14	2SC2632R	TRANSISTOR
	TKX828001	PC BOARD HOLDER	Q31	2SC828AQ	TRANSISTOR
	TUW82932	CRT BAND	Q44	2SD884LB	TRANSISTOR
	TUX80702-1	CHASSIS FLAME			
	TUX80703-1	UPPER PLATE			
	TUX80971	CORD BRACKET		DIODES	
	TBM800049	MODEL PLATE	△ D31	TVS10E1	DIODE
	TES8143-6	SPRING(CRT EARTH)	△ D43	TVSBB4A	DIODE
	TMM1455	BEADS BAND	△ D44	TVSS1R80	DIODE
	TMM81438	RIVET	△ D46	TVSBB2	DIODE
	TMK81526	STOPPER	△ D47	TVSD1R20	DIODE
	TMK81744	CRT RUBBER	△ D49	TVSBB2A	DIODE
	XTB4+10A	SCREW	△ D51	TVSBB2A	DIODE
	XTB4+12A	SCREW		COIL & TRANSFORMERS	
	XTV3+8F	SCREW			
	XTW3+8L	SCREW	△ L141	TLT047-999	PEAKING COIL
	XWC4B	WASHER	△ L402	TLH80410	COIL
	XYE3+EF8	SCREW	△ L403	TLH80724	COIL
	150BGB31	PICTURE TUBE	△ L404	TLH80608	COIL
	TNP82851-24	PC BOARD W/COMPONENT	△ T401	TLF80894	FLYBACK TRANS
				CONTROL	
	TLY80340A	DEFLECTION YOKE	VR11	EVMHOGAOOB52	CONTROL B 500 OHM
	XTS3+8F	SCREW	VR31	EVNKOAA00B15	CONTROL B 100K OHM
	TJC341	TERMINAL(1P)	VR32	EVNKOAA00B54	CONTROL B 50K OHM
	TXAJTC4P285	4P CONNECTOR ASSY	VR33	EVNKOAA00B14	CONTROL B 10K OHM
	TSN85511	MAGNET	VR41	EVMHOGAOOB13	CONTROL B 1K OHM
	TPC822151	OUTER CARTON	VR64	EVTJ6US05B26	CONTROL B 2M OHM
	TXAPD15001A	FILLER	VR67	EVMHOGAOOB25	CONTROL B 200K OHM
	TPE84044	SET COVER			
	TQF80809	DATE LABEL		CAPACITORS	
	TQF83825	SERIAL NO LABEL			
	I.C		C143	ECCF1H181J	C 180PF J 50V
IC31	AN5763	INTEGRATED CIRCUIT	C145	ECEA1JU100	E 10UF 63V
IC42	AN5790	INTEGRATED CIRCUIT	C146	ECKF1H103ZF	C 0.01UF Z 50V
			C301	ECQM1H223JZ	P 0.022UF J 50V

Ref.No.	Part No.	Description				Ref.No.	Part No.	Description			
C302	ECQM1H223JZ	P	0.022UF	J	50V	R412	ERD25FJ102K	C	1K OHM	J	1/4W
C303	ECQM1H103JZ	P	0.01UF	J	50V	▲ R423	ERD25FJ220K	C	22 OHM	J	1/4W
C304	ECSF1VE334V	T	0.33UF		35V	▲ R432	ERQ1CJP100	F	10 OHM	J	1W
C305	ECSF1CE475Y	T	4.7UF		16V	▲ R441	ERD25FJ6R8K	C	6.8 OHM	J	1/4W
C306	ECSF1CE475Y	T	4.7UF		16V	R442	ERD50FJ1R0	C	1 OHM	J	1/2W
C307	ECEA1CU100	E	10UF		16V	R443	ERD25FJ101K	C	100 OHM	J	1/4W
C308	ECEAOJU330	E	33UF		6.3V	R447	ERG1ANJ221	M	220 OHM	J	1W
C309	ECEA1CU221	E	220UF		16V	▲ R460	ERD25FJ560K	C	56 OHM	J	1/4W
C310	ECEA1AU102	E	1000UF		10V	▲ R461	ERD25FJ6R8K	C	6.8 OHM	J	1/4W
C311	ECQM1H333JZ	P	0.033UF	J	50V	R465	ERD25FJ274K	C	270K OHM	J	1/4W
C313	ECEA1CU100	E	10UF		16V	R466	ERD25FJ393K	C	39K OHM	J	1/4W
C404	ECQM1H183JZ	P	0.018UF	J	50V	R472	ERC12GJ104	S	100K OHM	J	1/2W
C405	ECQM1H153JZ	P	0.015UF	J	50V	R600	ERC12GJ223	S	22K OHM	J	1/2W
C407	ECEA1EU4R7	E	4.7UF		25V	R601	ERC12GJ152	S	1.5K OHM	J	1/2W
C408	ECQM1H333JZ	P	0.033UF	J	50V	▲ R603	ERD25FJ103K	C	10K OHM	J	1/4W
C410	ECQM1H472JZ	P	4700PF	J	50V	▲ R605	ERD25FJ103K	C	10K OHM	J	1/4W
C411	ECQM1H102JZ	P	1000PF	J	50V	▲ R606	ERD25FJ103K	C	10K OHM	J	1/4W
C412	ECQS1332JWT	S	3300PF	J	100V		OTHERS				
C423	ECEA1CU221	E	220UF		16V		TJS2564OV				
C430	ECQM1H223JZ	P	0.022UF	J	50V		CRT SOCKET				
▲ C441	ECKD2H332KB9	C	3300PF	K	500V		TMK81565				
▲ C443	ECQM4123KZ	P	0.012UF	K	400V		TMM81416				
▲ C444	ECEA25W6R5Q	E	6.5UF		25V		CORD BAND (SMALL)				
C445	ECEA1CU101	E	100UF		16V		TMM81434				
▲ C460	ECQE6223KZ	P	0.022UF	K	600V		RIVET				
▲ C461	ECEA1JU101	E	100UF		63V		TQF81862				
▲ C462	ECKC3A221KB6	C	220PF	K	1KV		FUSE LABEL				
C463	ECEA2VSO1OY	E	1UF		350V	CL1	XBA1C2ONU100				
C465	ECEA2VSR47Y	E	0.47UF		350V	K	XTV3+8B				
C491	ECEA1CU222	E	2200UF		16V	P	TERMINAL				
C600A	ECQE4104KZ	P	0.1UF	K	400V	SF1	TJS8A4150				
C602	ECKD2H102KB2	C	1000PF	K	500V	SF2	3P CONNECTOR				
						Y	TJS868260				
							4P SOCKET				
							FUSE HOLDER				
							FUSE HOLDER				
							5P CONNECTOR				
							RESISTORS				
R120	ERD25FJ470K	C	47 OHM	J	1/4W						
R121	ERD50FJ101	C	100 OHM	J	1/2W						
R141	ERC12GJ182	S	1.8K OHM	J	1/2W						
R143	ERD25FJ470K	C	47 OHM	J	1/4W						
R144	ERD25FJ101K	C	100 OHM	J	1/4W						
R300	ERD25FJ153K	C	15K OHM	J	1/4W						
R301	ERD25FJ472K	C	4.7K OHM	J	1/4W						
R302	ERD25FJ683K	C	68K OHM	J	1/4W						
▲ R303	ERD25FJ6R8K	C	6.8 OHM	J	1/4W						
▲ R304	ERD25FJ1R1K	C	1.1 OHM	J	1/4W						
R305	ERD25FJ683K	C	68K OHM	J	1/4W						
R306	ERD25FJ563K	C	56K OHM	J	1/4W						
R307	ERD25FJ4R7K	C	4.7 OHM	J	1/4W						
R310	ERD25FJ153K	C	15K OHM	J	1/4W						
R312	ERD25FJ681K	C	680 OHM	J	1/4W						
R313	ERD25FJ271K	C	270 OHM	J	1/4W						
R314	ERD25FJ391K	C	390 OHM	J	1/4W						
R315	ERD25FJ101K	C	100 OHM	J	1/4W						
R316	ERD25FJ181K	C	180 OHM	J	1/4W						
R317	ERD25FJ103K	C	10K OHM	J	1/4W						
R318	ERTD2ZHL333S	THERMISTOR									
R400	ERD25FJ101K	C	100 OHM	J	1/4W						
R404	ERD25FJ153K	C	15K OHM	J	1/4W						
R405	ERD25FJ332K	C	3.3K OHM	J	1/4W						
R407	ERD25FJ103K	C	10K OHM	J	1/4W						
R408	ERD25FJ273K	C	27K OHM	J	1/4W						
R409	ERD25FJ222K	C	2.2K OHM	J	1/4W						
R410	ERD25FJ223K	C	22K OHM	J	1/4W						

# Service Manual

*Supplement - 1*

CRT Data Display  
**MODEL TR-60S1A**  
**Chassis No. Y21**

Please use this manual together with the service manual for Model No. TR-60S1A  
 Order No. FTD86055079C1.

No.	Reason	Ref. No.	Original Part No.	New Part No.	Part Name & Description			Applicable S/N
1	Countermeasure for short/open test	R307 R423 R432 R442	ERD25FJ4R7K ERD25FJ220K ERQ1CJP100 ERD50FJ1R0	ERQ14AJ4R7 ERD25FJ470K ERG2ANJ100 ERD25FJ1R0K	F C M C	4.7Ω J 1/4W 47Ω J 1/4W 10Ω J 2W 1.0Ω J 1/4W		F□6330001
2	Customer request (Change +B-Voltage)	J70 H2-H2 H4-H2	None Lead wire (22cm) AWG24, Red None	ERD25FJ5R6K Delete Lead wire (26cm) AWG24, Red Insert H2 on CRT socket board Input voltage: 12V Input voltage : 11.75V	C	5.6Ω J 1/4W		F□6330001
3	To improve temperature derating	C307 C308 C461	ECEA1CU100 ECEA0JU330 ECEA1JU101	ECEA1CG100S ECEA1CG330S ECEA1JG101S	E E E	10μF 16V 33μF 16V 100μF 63V		F□6330001
4	Cost down	R121	ERD50FJ101	ERD25FJ101K	C	100Ω J 1/4W		F□6330001
5	To improve temperature derating	R314	ERD25FJ391K	ERDS1FJ391	C	390Ω J 1/2W		F□7350001
6	Countermeasure for malfunction of X-ray protector	R407	ERD25FJ103K	ERD25FJ101K	C	100Ω J 1/4W		F□7350001
7	To improve reliability	R472 R600	ERC12GJ104 ERC12GJ223	ERC12AGK104 ERC12AGK223	S S	100kΩ K 1/2W 22kΩ K 1/2W		F□7460001
8	Customer request (To ensure securing the deflection yoke)		Amount of resin to the deflection yoke is about 0.5g	Increase amount of resin to the deflection yoke (About 1.0g)				F□7360001

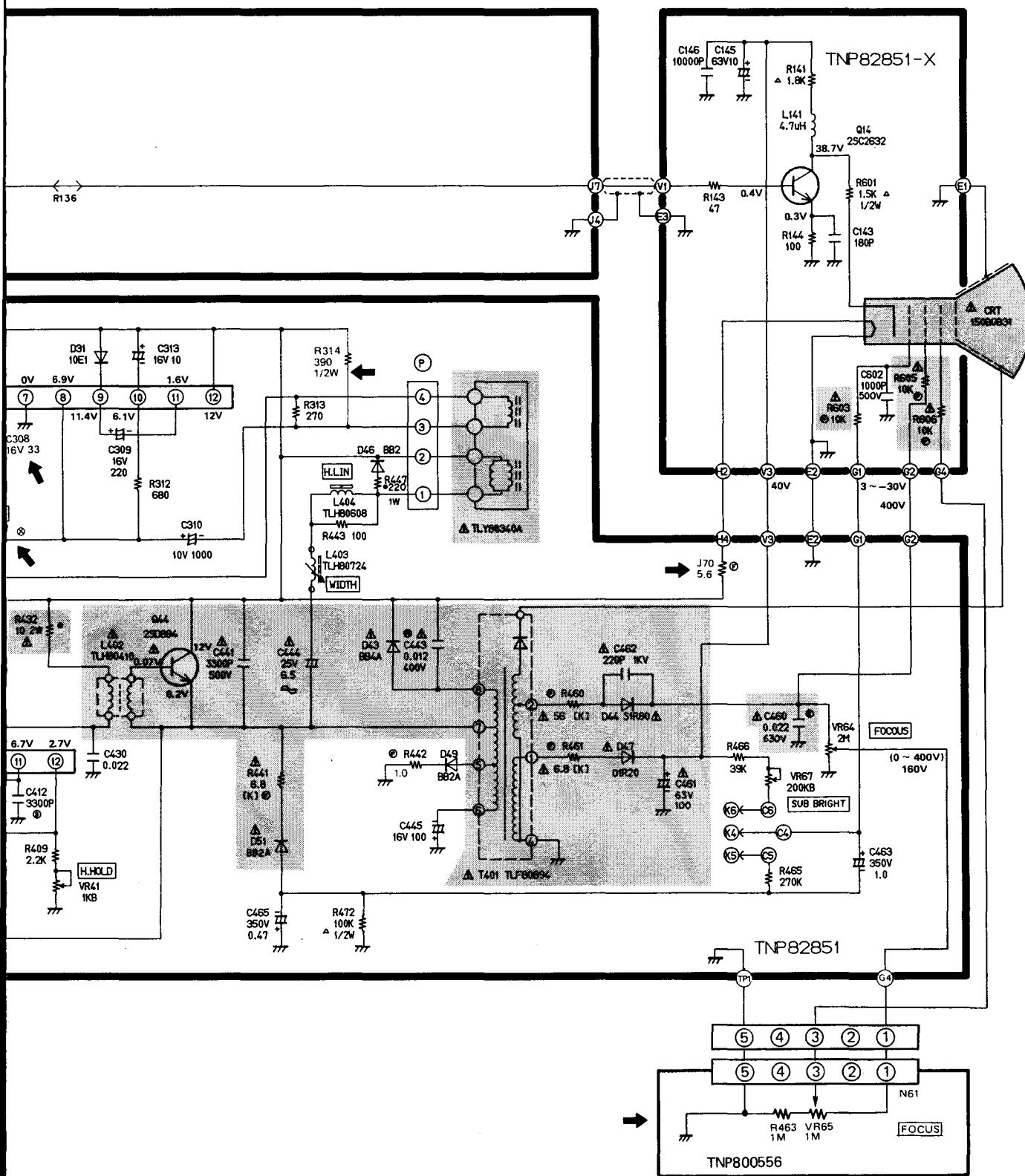
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Panasonic Industrial Company Division of  
 Matsushita Electric Corporation of America  
 Two Panasonic Way, Secaucus, New Jersey 07094



## IMPORTANT SAFETY NOTICE

The component identified by shading or the international symbol  $\Delta$  on this schematic diagram incorporates special features important for protection from X-Radiation, fire and electrical shock hazards. When servicing it is essential that only manufacturer's specified parts be used for those critical components.



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